

Castanea sativa Ancient Trees Across Europe: Genetic Diversity And Conservation Strategy.

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Abstract

Long-living trees are witnesses of environmental changes and human interventions; these extraordinary organisms not only represent a historical, landscape and environmental heritage of inestimable value, but they also are a reserve of genetic variability which can be considered as a great resource for management programs of forest species. This is the first genetic study on Italian ancient chestnut trees (*Castanea sativa* Mill.). Ninety-nine ancient trees including the oldest known chestnut in Europe, named 'Cento Cavalli', which is believed to be between 3,000 and 4,000 years old, were collected. For each tree, more than one sample from canopy and root suckers was collected to test for the genetic integrity of the individuals. The samples were genotyped using nine nuclear microsatellite markers (nSSRs) and two chloroplast markers (cpDNA). Genetic variability indices were evaluated using GeneA1Ex 6.5, GenoDive 3.0 and HP-rare software. We identified a total of 106 unique genetic profiles within the analyzed individuals. A Bayesian analysis was performed using the software STRUCTURE to unveil the genetic relationships existing between the genotyped individuals. We were able to identify a geographic pattern of genetic diversity among the old chestnut trees. In addition, the genetic similarity among the ancient trees and the close chestnut populations was studied. A phylogeographic structure of plastid diversity was also established. Our results contribute to evaluate the European chestnut genetic resources, gave insights to its domestication history and to define the best conservation and management strategies.